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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/856,358	05/22/2001	Takehiko Kezuka	P07223US00/L	6873

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EXAMINER	
UMEZ ERONINI, LYNETTE T	
ART UNIT	**PAPER NUMBER**
1765	

DATE MAILED: 05/01/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/856,358	KEZUKA ET AL.	
	Examiner	Art Unit	
	Lynette T. Umez-Eronini	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-16 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) _____ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) 1-16 are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> ((b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claim 1, 15, and 16 are rejected under 35 U.S.C. 102(b) as being anticipated by Li (US 5,783,495).

Li teaches an etching solution comprising hydrofluoric acid, wherein a ratio of an etch rate of boron silicate glass film/ an etch rate of a thermal oxide film at 25°C is 10 (378 $Å min^{-1}$/36 $Å min^{-1}$) or higher (column 5, lines 48-50; column 6, lines 52-54 and 56-59; and Table 1), as in claim 1. Li further teaches an etching method used in fabricating semiconductor devices (column 1, lines 13-19), which reads on a method for producing an etched article by etching an article to be etched with the etching solution, as in claim 15 and an etched article, which is obtainable by the said method as in claim 16.

Claim Rejections – 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li ('495) as applied to claim 1 above, and further in view of Grant et al. (US 5,439,553).

Li differs in failing to teach a solvent in the etching solution has a relative dielectric constant of 61 or lower, in claims 2-3.

Grant teaches an etchant comprising HF along with organic materials such as methanol, isopropanol, acetone and acetic acid (column 5, line 63 – column 6, line 6 and claims 3-5) and further teaches these solvents prevent condensation and other contaminants on the oxide surface (column 3, lines 43-54)

It is the examiner's position that it would have been obvious to one skilled in the art at the time of the claimed invention to modify Li by employing organic having a dielectric constant of less than 61 for the purpose of preventing deposition of contaminants of the substrate.

5. Claims 4-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li ('495) as applied to claim 1 above, and further in view of Grant ('439) and Bertens (US 3,968,565).

Li in view of Grant differ in failing to teach in failing to specify the etchant composition as recited in claims 4-10.

Bertens teaches the chemical etching rate varies strongly with the composition of the etching liquid (column 2, lines 17-20), which serves as evidence that the composition of the etchant is a so-called "result effective variable."

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Li in view of Grant by varying the composition of the etchant as taught by Bertens since it has been held that the discovery of an optimum value for result effective variables is within the purview of routine experimentation by the person of ordinary skill in the art. In re Boesch, 617 F.2d 272, 276, 205 USPQ 215, 219 (CCPA 1980).

6. Claims 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li ('495) as applied to claim 1 above, and further in view of McNeilly et al. (US 5,294,568).

Li differs in failing to teach the etching solution comprises an inorganic acid that has a pk_a of 2 or lower and the etching solution wherein the percent by weight ratio of HF: HCl:water is 0.01-50:1-36:0-99.

McNeilly teaches an etching solution comprising HCl (same as applicant's organic acid having a pk_a = -8, Specification, page 5, lines 7-9), 38.4 wt % HF from HF/H_2O and 20.2 wt % HCl form HCl/H_2O (column 6, lines 26-30, which lies within the range of the ratio of HF:HCl:water, which is 0.01-50:1-36:0-99. McNeilly further teaches exposing a substrate to hydrogen halide vapor and water vapor under appropriate conditions and long enough to remove the native oxide but not long enough to remove any significant amount of other oxides (column 2, lines 49-54).

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Li's etchant by

employing an inorganic acid as taught by McNeilly for the purpose of selectively removing unwanted native oxide while etching the other oxide layers.

7. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Li ('495) as applied to claim 1 above, and further in view of Wanlass (US 3,997,381).

Li differs in failing to specify the percent weight ratio of HF:HNO3:water is 0.01-50:1-70:0-99.

Wanlass teaches an etching solution comprising of hydrofluoric (49% by weight), nitric (70% by weight), (column 7, lines 10-14), which reads on the percent weight ratio of HF:HNO3:water is 0.01-50:1-70:0-99.

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Li's etchant by employing an inorganic acid as taught by Wanlass for the purpose of selectively etching doped oxide and undoped oxides (see Wanlass, column 7, lines 14-20).

Response to Arguments

8. Applicant's arguments filed February 24, 2003 have been fully considered but they are not persuasive. Applicant traverses the rejection of claims 1, 15, and 15 under 102(b) as being anticipated by Li ('495). Applicant argues that Li fails to anticipate or make obvious the present claims by failing to teach an etch rate of BSG to THOX at 25°C is 10. Applicant further argues that the etching solution of example 1 of Li., i.e., 0.49% HF aqueous solution, has an etch rate selectivity of 10.5 (see column 6, lines 56-

59, column 7, lines 5-6 and column 7, table 1), which corresponds to "about 6.5" in the present invention and the difference in etch rate ratio may be derived from the difference in how to make BSG or BPSG. Applicant's argument is unpersuasive because Li teaches, "The cleaning solution may be used . . . from 15° to 25°C" (column 5, lines 48-50). "The cleaning solution . . . shall be further described by way of illustrating Examples 1 and 2 . . ." (column 6, lines 41-44). "The etch rate for BPSG in diluted HF test solution without TMAH as shown in Table 1 was 378 Å/min. The etch rate for thermal oxide in the diluted HF test solution without TMAH was 36 Å/min" (column 6, lines 56-59). The aforementioned reads on, an etch rate of (378 Å/min/36 Å/min) 10.5 and further reads on an etching solution comprising hydrofluoric acid, wherein a ratio of an etch rate of a boron silicate glass film (BSG) or boron phosphosilicate glass/ and etch rate of a thermal oxide film (THOX) at 25°C is 10 or higher as claimed in the instant invention.

Applicant traverses the 103 rejection of claims 2 and 3 as being unpatentable of Li in view of Grant ('553). Applicant argues that deficiencies of Li are not overcome by combining Grant, which discloses an invention characterized by combination of gas phase and controlled liquid phase reaction reactions in which organic gas and halide-containing species (for example, HF gas). Applicant's arguments are unpersuasive because the claimed invention does not require either the etching solution comprising hydrofluoric acid nor the solvent is in a liquid or a gas phase.

Applicant traverses the 103 rejection of claims 4-10 as being unpatentable over Li in view of Grant and Bertens ('565). Applicant argues that Bertens fails to disclose or

suggest how to prepare such a composition having specific etch rate selectivity. Applicant's arguments are unpersuasive because Bertens is relied upon to teach the chemical etching rate varies strongly with the composition of the etching liquid (column 2, lines 17-20) and to provide evidence that the composition of the etchant is a so-called "result effective variable."

Applicant traverses the 103 rejection of claims 11-13 as being unpatentable over Li in view of McNeilly ('568). Applicant argues that McNeilly discloses how to remove native oxide without removing other oxides such as THOX, BSG. BPSG and thus not discloses of suggest the claimed invention. Applicant's argument is unpersuasive because McNeilly is relied upon to teach Li's deficiencies, an inorganic acid that has a pk_a of 2 or lower and the etching solution wherein the percent by weight ratio of HF: HCl:water is 0.01-50:1-36:0-99. McNeilly teaches an etching solution comprising HCl (same as applicant's organic acid having a pk_a = -8, Specification, page 5, lines 7-9), 38.4 wt % HF from HF/H_2O and 20.2 wt % HCl form HCl/H_2O (column 6, lines 26-30, which lies within the range of the ratio of HF:HCl:water, which is 0.01-50:1-36:0-99, as claimed in the instant invention.

Last, applicant traverses the 103 rejection of claim 14 as being unpatentable over Li in view of Wanlass ('381). Applicant argues that Wanlass patent relates only to an unrelated etching solution that cannot be added to Li in order to make the present invention obvious. Applicant's argument is unpersuasive because Wanlass is relied upon to teach Li's deficiencies, the percent weight ratio of HF:HNO3:water is 0.01-50:1-70:0-99. Wanlass teaches an etching solution comprising of hydrofluoric (49% by

weight), nitric (70% by weight), (column 7, lines 10-14), which reads on the percent weight ratio of HF:HNO3:water is 0.01-50:1-70:0-99, as claimed in the instant invention.

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynette T. Umez-Eronini whose telephone number is 703-306-9074. The examiner is normally unavailable reached on the First Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on 703-308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are 703-972-9310 for regular communications and 703-972-9311 for After Final communications.

BENJAMIN L. UTECH
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

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April 29, 2003